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Discovering the Light Bulb Tunicate

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The lightbulb tunicate, *Clavelina lepadiformis,* photographed by the author. It’s easy to see how it got its name!

Discovering the Light Bulb Tunicate

by Jamie Reinhardt

There is always a sense of excitement when you see something for the first time. I had spent a considerable portion of the summer of 2009 surveying various underwater habitats along the southern New England coastline from Branford, Connecticut up to Newport, Rhode Island. While I always enjoy donning my SCUBA gear and spending some submerged time photographing animals that live on the bottom, the summer had mostly been filled with photos of the usual suspects (the sea squirts *Botryllus schlosseri* and *Botrylloides violaceus*). It was just another dive late in the year. I had brought along my dive buddy Dave Hudson, a crustacean physiologist and invasive crab expert. The plan was to simply go down and survey a breakwater in Stonington Harbor, taking some biomass samples and photographs haphazardly along the wall. It wasn't more than 20 minutes into our dive that Dave tugged at my fin and signaled me to take a closer look at a segment of the wall I had just passed. Dave knew that this species was unique; I knew that we needed to get a sample.

The light bulb tunicate (*Clavelina lepadiformis*) is both distinctive and conspicuous, meaning that it is easy to see and identify. *Clavelina* is a colonial ascidian (sea squirt), small individuals (zooids) are attached together to form a larger colony. It appears to have fluorescent white lines running down the front and sides of an individual while the rest of the body appears translucent. It is easy to see why its common name is the light bulb tunicate. Usually *Clavelina lepadiformis* is found in Europe, and has a natural range from Norway in the north all the way to the Mediterranean Sea. As a species it survives well in fresh Norwegian fjords (with lots of cold freshwater runoff) as well as the highly saline Mediterranean, and of course can deal with those temperature extremes as well.

We collected the sample. Dave and I scraped the 5 or 6 zooids into a plastic Ziploc® bag with my dive knife, and sealed the bag shut. I felt lucky that we were able to retain all of the colonies that we had seen, to make sure we had a large enough sample for a proper taxonomic and genetic analysis. Dave and I swam on, continuing our survey. But when we swam around the next turn along the wall, we were amazed. The water was bright from all of the "light bulbs" in the water. Wow, I thought, I guess we did not collect the only specimens. A couple of things came to mind: 1) this species is new here and 2) has the ability to quickly become a dominant part of the community.

Back in its native range *Clavelina* can also be a relatively dominant species on shallow rocky surfaces. But could it be anything like this? Dave and I would have to come back to get a better quantification of the community characteristics, but for now we wanted to get back to the University of Connecticut at Avery Point as quick as we could in order to get an identification of the New Invader.

Although *Clavelina lepadiformis* is distinctive enough to identify without complicated techniques, we needed to be sure. So, we enlisted University of Connecticut molecular and ascidian taxonomic expert Lauren Stefaniak. When Lauren got back to us, not only did she provide us with a species identification, she was able to identify the samples of *Clavelina* as belonging to an invasive strain of the species in European harbors and ports! Researchers in Europe had already been doing some work on the genetics of *Clavelina* and comparing different genetic strains. It appears as if the populations of *Clavelina* that exist within harbors and ports in Europe are different from those that naturally occupy the rock outcrops outside the harbors. Even harbor populations as far away as Spain and Germany might be genetically more similar to each other than two populations that are separated by two or three miles. This is because the ships that transport cargo between two ports also transport other unintended things. As the genetic data suggest, *Clavelina* is one of those unintended "hitchhikers". Organisms like *Clavelina* and other tunicates like to settle on the bottoms of ships because they provide plenty of hard surface to grow on. For this reason, *Clavelina*, other ascidians, barnacles and other marine animals that settle on hard surfaces are called fouling organisms.

Later in the week Dave and I loaded up the University of Connecticut's 24 foot Boston Whaler with our dive equipment to head back to Stonington Harbor. We needed the boat to access some more restricted areas of the harbor to survey the extent of the *Clavelina* infestation. We found out that while the populations were localized (limited to 2 or 3 structures), *Clavelina* occupied over 30% of the substrate in some areas. In other words, *Clavelina* was a large portion of the total biological matter in some areas.

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The light bulb tunicate (*Clavelina lepadiformis*) is both distinctive and conspicuous.

What does the invasion of *Clavelina* mean for our local biological communities and ecology? Animals like *Clavelina* can have many nasty consequences for the ecosystems that they invade, as well as for local industries which rely on the ocean. For instance, when *Clavelina* or other fouling organisms start growing in the intake pipes of power plants, this reduces the flow rate of water and decreases the efficiency of cooling. Running power plants at less efficient levels is costly to all of us and may be reflected in the price of a kilowatt that you need to run your own light bulb.

Along the Connecticut coast there are many shellfish aquaculturists who are acutely aware of the negative consequences of fouling organisms. Oftentimes fouling organisms can grow on the shells of oysters or on the nets that oysters are grown in. When this happens, the fouling organisms can interfere with the efficient feeding of the shellfish by both blocking and reducing water flow or by directly competing for food resources. Shellfish farmers spend a great deal of time and money preventing the fouling of their produce and constantly cleaning their nets.

Since power plant operators and shellfish farmers already have to deal with fouling organisms, what difference does it make that one more ascidian comes along and is added to the "problem list"? Steve Malinowski, owner and chief scientist at Fisher Island Oysters, explained it to me best: It is not just that there might be more biomass to remove at any one time from your nets, it's that you might have to do it later into the season or into the winter. Continuing intense cleaning operations into the winter not only is costly but for operations in New England and Maritime Canada can be dangerous. Winter is the time when the waves pick up and doing complicated procedures in cold water means increased risk for laborers.

So what can we do? Eradication of an invasive species is a difficult proposition. Although eradication has been successful in a few circumstances, this option is usually cost-prohibitive. Instead, everyone can do their part to decrease the risk of spreading invasive species and other unwanted pests (not just in the ocean but for terrestrial and freshwater too!). For people who like to boat and fish–and that's a lot of us–make sure to clean your boat hull regularly and always do so when you transport your vessel to another lake or body of water. Make sure you dispose of bait packaging (often seaweed from a distant location) in the trash and not over the gunnel. Check out useful resources at Connecticut Sea Grant online at http://seagrant.uconn.edu/whatwedo/ais/. We all can keep a watchful eye on our coastline.

When you are down on the Connecticut shore this summer, spend some time getting to know the plants and animals along the beach and dock. Whether you're wearing a swimsuit and flip flops, a snorkel mask or a wet suit—maybe you'll be the one who discovers something new!

About the author –

James Reinhardt is a recent graduate from the University of Connecticut Department of Marine Sciences. His doctoral work focused on the community ecology and patterns of recruitment of benthic organisms in Long Island Sound, particularly invasive species. Following his graduation Jamie served as a Dean John A. Knauss Marine Policy Sea Grant Fellow for the National Oceanographic and Atmospheric Administration's Office of Habitat Conservation and is now continuing his work with NOAA as a contractor for I.M. Systems Group.